

### **REMARKS**

Applicant appreciates the consideration shown by the U.S. Patent Office, as evidenced by the October 18, 2006 Office Action. Claims 1-136 are pending in the application and Claims 93-99, 121-136 have been withdrawn. In that Office Action, claims 1-92 and 100-120 were rejected. As such, claims 1-92 and 100-120 remain in the case with none of the claims being allowed.

The October 18, 2006 Office Action has been carefully considered. Applicant respectfully requests reconsideration of the application by the Examiner in light of the following remarks offered in response to the October 18, 2006 Office Action.

#### **Specification**

Applicant has amended the abstract [0077] to delete duplicate occurrence of the word 'solution', and amended the specification [0001] paragraph with the priority claim information, which was properly claimed at time of filing. The specification amendments correct only typographical errors. None of the aforementioned amendments were made to overcome prior art. The amendments have been made to facilitate prosecution of the application and do not include new matter and are not related to patentability, but correct a minor typographical omission.

#### **Nonobviousness**

**The claims are not obvious because the cited reference fails to disclose or demonstrate that sulfur in gasoline must also be removed along with SO<sub>x</sub>, as SO<sub>x</sub> is removed in or from the regenerator under an exothermic oxidizing environment in direct contrast to sulfur in gasoline, which is removed in or from the reactor under an endothermic reducing environment.**

The Office Action rejected Claims 1-92 and 100-120 under 35 U.S.C. 103(a) as allegedly unpatentable over Vierheilig (U.S. Patent 6,028,023).

The Office Action expressly admits that the reference "does not specifically mention reducing sulfur in gasoline produced in an FCC unit" (Office Action page 5 last paragraph). Nonetheless, the Office Action erroneously alleges "the invention does disclose the use of HTL

compound in an FCC unit as a  $SO_x$  sorbent, hydrocarbon cracking catalyst, and catalyst carrier or binder material to refine petroleum. Since HTL is effective for  $SO_x$  absorption and HTL can also be used as a FCC catalyst, it is expected that the use of HTL as FCC catalyst will *reduce sulfur in gasoline* during the FCC process. Therefore, any gasoline produced in a FCC process using HTL as a component (either as a catalyst or as a  $SO_x$  sorbent), must be reduced in sulfur. Thus, it would have been obvious to one skilled in the art at the time the invention was made to modify Vierheilg invention and reduce sulfur in gasoline from the FCC unit by contacting HTL with the feedstock for a better quality gasoline.” (Office Action page 5 last paragraph)

Although the Office Action even expressly admits that the reference does not disclose reducing sulfur in gasoline produced in an FCC unit, ironically, the Office Action contradicts itself and erroneously and inconsistently misquotes that “Vierheilg discloses a process for *reducing sulfur* in a FCC unit to refine petroleum (Column 15, lines 15-18). (Office Action page 3 last paragraph)

Furthermore, the Office Action does not provide any support for its self-contradictory erroneous assertion and incorrect misquote that “**Vierheilg discloses a process for reducing sulfur** in a FCC unit to refine petroleum (Column 15, lines 15-18” (Office Action page 3 last paragraph). As correctly and exactly quoted below, Vierheilg ‘023, Column 15, lines 15-18 specifically discloses using HTL for  $SO_x$  sorption, not for reducing *sulfur in gasoline* in an FCC:

“Thus, using  $SO_x$  sorption in a FCC unit used to refine petroleum as an example, the method of extending the useful life of an  $SO_x$  sorbent (or catalyst) may be expressed in patent claim language in the following manner” (Col. 15 line 15-18)

Contrary to the Office Action’s erroneous assertion, the claims are not obvious because the cited reference fails to disclose that sulfur in gasoline would also be removed. The mere fact that a certain thing, [such as sulfur in gasoline] *may* result from a given set of circumstances is not sufficient.” In re Oelrich, 666 F.2d. 578, 581. The missing element *must* necessary result from the references. In this case, the cited reference does not disclose that the sorbent material *must* remove *sulfur in gasoline*, as even expressly admitted in the Office Action. (Office Action page 5 last paragraph). Consequently, the Office Action fails to demonstrate *every aspect* of all the claim limitations, as expressly required by the MPEP.

To establish a *prima facie* case of obviousness, the MPEP explicitly *requires* the Examiner to demonstrate all the following three criteria. First, there *must* be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine to the reference teachings. Second, there *must* be a reasonable expectation of success. Finally, the prior art reference (or references when combined) *must* teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 -§ 2143.03.

The test for non-obviousness is not whether it would be merely advantageous or possible to combine references but whether the prior art suggests the motivation to combine the references. “[T]he mere fact that the references can be combined or modified does not make the resultant combination obvious unless the prior art suggests the desirability of the combination”. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); See MPEP section 2143.01. In this case, the issue is not whether the cited reference may merely be modified to use the cited SOx sorbent to remove sulfur in gasoline, but whether the cited reference provides any suggestion or motivation to modify to use the cited SOx sorbent to remove sulfur in gasoline as well as a reasonable expectation of success.

“The initial *burden is on the examiner* to provide some suggestion or motivation to modify” and a reasonable expectation of success. *Ex parte Clapp*, 227 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985); See MPEP § 2144 -§ 2144. The teaching or suggestion to make the modification and the reasonable expectation of success must both be found in the reference. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP § 2143 -§ 2143.03. When the motivation to modify the teachings of the reference is not immediately apparent, it is the duty of the examiner to explain why the modification of the teaching is proper.

Consequently, in this case, Applicant respectfully submits that independent claims 1, 16, 30, 44, 57, 67, 77, and 100 are not obvious because the Office Action not only fails to demonstrate that sulfur in gasoline *must* be reduced, but also fails to demonstrate a motivation to modify to remove sulfur. Nor has the Office Action demonstrated *any* expectation of success.

Applicant respectfully submits that as current independent claims are not obvious, all the claims dependent thereon are also not obvious.

Assuming arguendo only that the Office Action demonstrates a prima facie case, the process taught by the '023 reference would not necessarily remove *sulfur in gasoline* as well as  $SO_x$  because the circumstance and environment in which, respectively,  $SO_x$  is removed and *sulfur in gasoline* is removed are in direct contrast to each other. Specifically, removing *sulfur in gasoline* occurs in the *reactor* where the cracking occurs while removing  $SO_x$  occurs in the *regenerator*. ['Removing *sulfur in gasoline* occurs in the *reactor* where the cracking occurs while removing  $SO_x$  occurs in the *regenerator*' is within the knowledge to one of ordinary skill in the art; non limiting examples of citations include Paragraphs 0003-0006 of filed specification; Publication No. 20040086442 paragraph 0003; U.S. Patent 4,744,962 (Column 2 line 13); U.S. Patent 6,129,833 (claim 1, Column 2 line 8)]. Furthermore,  $SO_x$  is removed in the regenerator under an *oxidizing environment* while *sulfur in gasoline*, in direct contrast, is removed in the *reactor under a reducing environment*. [U.S. Patent 6,129,833 (claim 1, column line 37)]. Moreover,  $SO_x$  is removed in the regenerator under an *exothermic environment* while *sulfur in gasoline*, in direct contrast, is removed in the reactor under an *endothermic environment*. [U.S. Patent 5,914,288 METAL SULFIDE INITIATORS FOR METAL OXIDE SORBENT REGENERATION (claim 1)]. Thus,  $SO_x$  is removed in the *regenerator under an exothermic oxidizing environment* while *sulfur in gasoline*, in direct contrast, is removed in the *reactor under an endothermic reducing environment*.

Thus, the cited reference may disclose sorbing  $SO_x$ ; however, the cited reference does not disclose a method for reducing the concentration of *sulfur in gasoline* as even admitted in the Office Action and nor does the cited reference disclose the motivation to modify and a reasonable expectation of success of using the cited  $SO_x$  sorbent to remove *sulfur in gasoline in the reactor under an endothermic environment*, as opposed to and in direct contrast to  $SO_x$  which is removed from the *regenerator under an exothermic oxidizing environment*. The issue is not whether the cited reference may merely be modified to use the cited  $SO_x$  sorbent to remove *sulfur in gasoline in the reactor under an endothermic environment*, but that the Office Action fails to demonstrate any suggestion or motivation to modify to use the cited  $SO_x$  sorbent

to remove *sulfur in gasoline in the reactor under an endothermic environment* as well as a reasonable expectation of success.

Thus, Applicant respectfully submits that the rejection is overcome and independent claims 1, 16, 30, 44, 57, 67, 77, and 100 are not obvious. Applicant respectfully submits that as current independent claims are allowable, all the dependent claims which depend from the respective independent claims are also allowable.

As note above, all the dependent claims which depend from the respective independent claims are also allowable. Applicant provides further additional reasons why the Office Action fails to demonstrate a prima facie case of obviousness of the following claims below.

Claim 77

The Office Action alleged that Claim 77 has all the limitations of claim 3 with only difference of XRD pattern displaying at least a reflection at a two theta peak position at about 43 degrees and 62 degrees. However, **the Office Action expressly admits** “Vierheilig does not specifically mention about two theta peak position at about 43 degrees and 62 degrees.

Claim 89

**The Office Action expressly admits** “Vierheilig does not specifically mention using zinc titanate or zinc aluminate ...” Nonetheless, the Office Action erroneously alleged “but the invention does disclose using calcium aluminate as a support for the HTL compound. It would have been obvious to one skilled in the art at the time the invention was made to modify Vierheilig invention and use zinc aluminate as support because calcium aluminate and zinc aluminate, both are functionally similar and it is expected that either of the supports will be effective in the sulfur removal from gasoline.”

As already stated above, the test for non-obviousness is not whether it would be merely advantageous or possible to combine references but whether the prior art suggests the motivation to combine the references. “[T]he mere fact that the references can be combined or modified does not make the resultant combination obvious unless the prior art suggests the desirability of the combination”. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); See MPEP section 2143.01. In this case, the issue is not whether calcium aluminate may merely be

modified with zinc aluminate, but whether the cited reference provides any suggestion or motivation to modify calcium aluminate with zinc aluminate, as well as a reasonable expectation of success. Also already stated above,  $SO_x$  is removed in the *regenerator under an exothermic oxidizing environment* while *sulfur in gasoline*, in direct contrast, is removed in the *reactor under an endothermic reducing environment*. In light of these differences, the Office Action fails to demonstrate any suggestion or motivation to modify calcium aluminate with zinc aluminate, as well as a reasonable expectation of success. Thus, Applicant respectfully submits that the rejection is overcome and claim 89 is not obvious.

Claim 105

The Office Action expressly admits “Vierheilig does not specifically mention about heating the HTL compound prior to contacting with the feedstock.” Nonetheless, the Office Action erroneously alleged that “Vierheilig does mention the use of HTL compound as hydrocarbon cracking catalyst and as a sorbent for  $SO_x$  absorption in the FCC process. Since FCC process is carried out at elevated temperatures, it would have been obvious to one skilled in the art at the time the invention was made to modify Vierheilig invention and heat the HTL compound prior to contacting with the feedstock for effective sulfur removal in the process.”

As already stated above, the test for non-obviousness is not whether it would be merely advantageous or possible to combine references but whether the prior art suggests the motivation to combine the references. “[T]he mere fact that the references can be combined or modified does not make the resultant combination obvious unless the prior art suggests the desirability of the combination”. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990); See MPEP section 2143.01. In this case, the issue is not whether the reference may merely be modified by heating the HTL compound prior to contacting with the feedstock, but whether the cited reference provides any suggestion or motivation to modify by heating the HTL compound prior to contact and a reasonable expectation of success.

Regarding heating as also already stated above,  $SO_x$  is removed in the *regenerator under an exothermic oxidizing environment* while *sulfur in gasoline*, in direct contrast, is removed in the *reactor under an endothermic reducing environment*. In light of these differences, the Office Action fails to demonstrate why the reference may merely be modified by heating the HTL

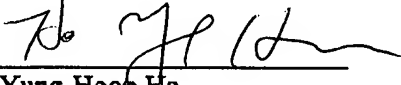
compound prior to contacting with the feedstock, as well as a reasonable expectation of success. Thus, Applicant respectfully submits that the rejection is overcome and claim 105 is not obvious.

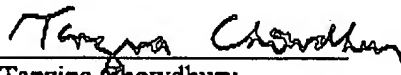
Applicant respectfully requests an Examiner interview and or submits that the present amendment places the application in condition for allowance. The Director is hereby authorized to charge any payments that may be due in connection with this reply to Wilmer Cutler Pickering Hale and Dorr LLP Deposit Account No. 08-0219.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Respectfully submitted,

Dated: January 17, 2007

  
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